NETWORK TRANSCEIVERS - MEMORY UPGRADES

EX-SFP-10GE-LR-AO
10Gbase SFP+ Transceiver

Features

- 10Gb/s serial optical interface compliant to 802.3ae 10GBASE LR
- Electrical interface compliant to SFF-8431 specifications for enhanced 8.5 and 10 Gigabit small from factor pluggable module “SFP+”
- 1310NM DFB transmitter, PIN photo-detector
- 2-wire interface for management specifications compliant with SFF 8472 digital diagnostic monitoring interface for optical transceivers
- Operating case temperature: 0°C to +70°C
- All-metal housing for superior EMI performance
- Low power consumption
- Advanced firmware allow customer system encryption Information to be stored in transceiver
- Cost effective SFP+ solution, enables higher port densities and greater bandwidth

Applications

High-speed storage area network
Computer cluster cross-connect
Customer high_speed data pipes
10GE Storage, 8G Fiber Channel

Product Description

This 1310 nm DFB 10Gigabit SFP+ transceiver is designed to transmit and receive optical data over single mode optical fiber for link length 10km.

The EX-SFP-10GE-LR-AO module electrical interface is compliant to SFI electrical specifications The transmitter input and receiver output impedance is 100 Ohms differential. Data lines are internally AC coupled. The module differential termination and reduce differential to common mode conversion for quality signal termination and low EMI. SFI typically operates over 200mm of improved FR4 material or up to about 150mm of standard FR4 with connector.

The transmitter converts 10Gbit/s serial PECL or CML electrical data into serial optical data compliant with the 10GBASE-LR standard. An open collector compatible Transmit Disable (Tx_Dis) is provided. A logic “1,” or connection on this pin will disable the laser from transmitting. A logic “0” on this pin provides normal opteration. The transmitter has a internal automatic power control loop (APC) to ensure constant optical power output across supply voltage and temperature variations. An open collector compatible

Transmit Fault (TFault) is provided. TX_Fault is a module output contact that when high,

indicates that the module transmitter has detected a fault condition related to laser operation or safety. The TX_Fault output contact is an open drain.collector and shall be pulled up to Vcc-Host in the host with a resistor in the range 4 7-10kΩ. TX_Disable is a module input contact. When TX_Disable is asserted high or left open, the SFP+ module transmitter output shall be turned off. This contact shall be pulled up to VccT with a 4.7kΩ to 10kΩ resistor.

The Receiver converts 10Gbit/s serial optical data into serial PECL/CML electrical data. An open compatible Loss of Signal is provided. Tx_LOS when high indicates an optical signal level below that specified in the relevant standard. The Rx-LOS contact is an open drain.collector output and shall be pulled up to Vcc_Host in the host with a resistor in the range 4.7-10kΩ, or with an active termination. Power supply filtering is recommended for both the transmitter and receiver. The Rx_LOS signal is intended as a preliminary indication to the system in which the SFP+ is installed that the received signal strength is below the specified range. Such an indication typically points to non-installed cables, broken cables, or a disabled, failing or a powered off transmitter at the far end of the cable.

Pin Definition

The SFP+ modules are hot-pluggable. Hot pluggable refers to plugging or unplugging a module while the host board is powered. The SFP+ host connector is a 0.8mm pitch 20 position right angle improved connector specified by SFF-8083 or stacked connector with equivalent electrical performance. Host PCB contacts mates with the host in the order of ground, power, followed by signal as illustrated by Figure 3 and the contact sequence order listed in Table 2.

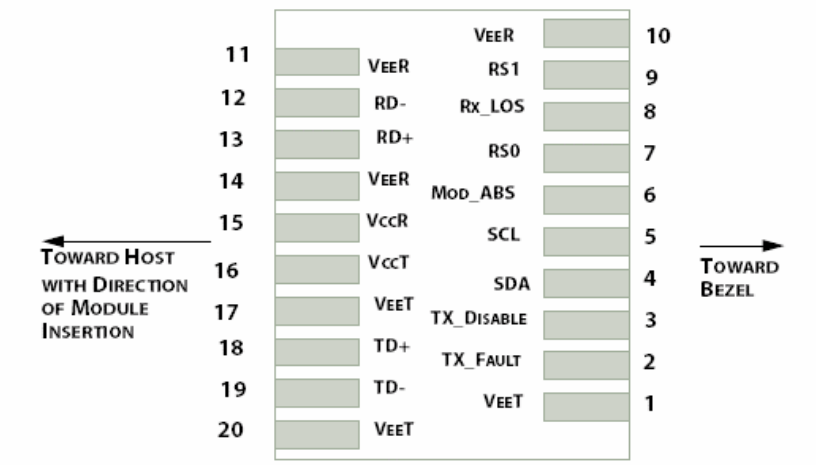


Figure 2: Module Interface to Host

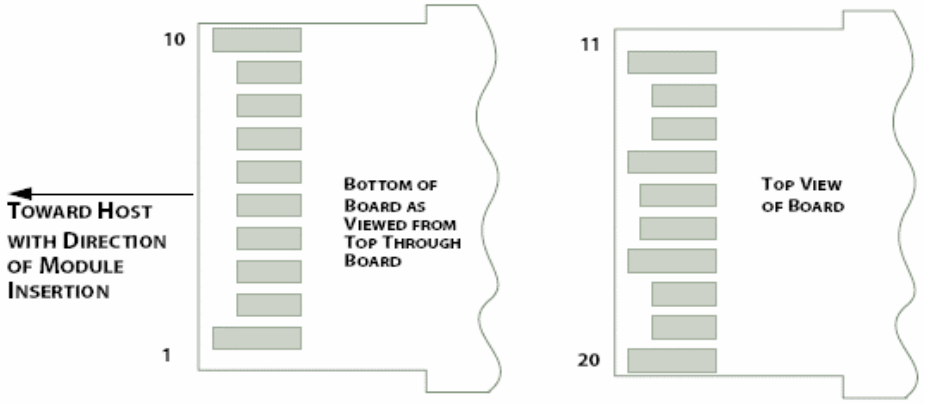


Figure 3: Module Contact Assignment

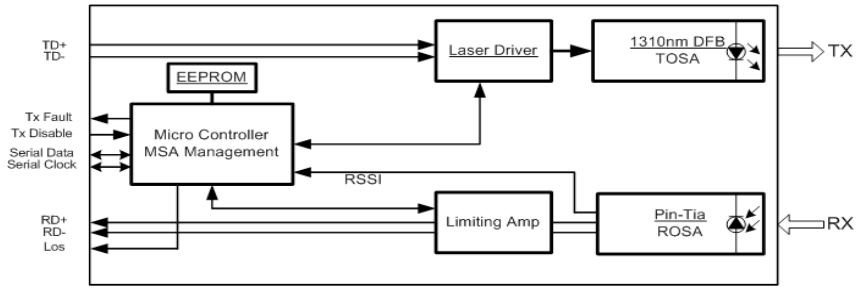
PIN	Logic	Symbol	Name/Description	Unit
1		VEET	Module transmitter Ground	1
2	LVTTL-O	TX_Fault	Module Transmitter Fault	
3	LVTTL-I	TX_Dis	Transmitter Disable; Turns off transmitter laser output	
4	LVTTL-I/O	SDA	2-Wire Serial Interface Data Line	2
5	LVTTL-I	SCL	2-Wire Serial Interface Clock	2
6		MOD_DEF0	Module Definition, Grounded in the module	
7	LVTTL-I	RS0	Receiver Rate Select	
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication Active LOW	
9	LVTTL-I	RS1	Transmitter Rate Select (not used)	
10		VeeR	Module Receiver Ground	1
11		VeeR	Module Receiver Ground	1
12	CML-O	RD-	Receiver inverted Data Output	
13	CML-O	RD+	Receiver Data Output (not used)	
14		VeeR	Module Receiver Ground	1
15		VccR	Module Receiver 3.3 V Supply	
16		VccT	Module Receiver 3.3 V Supply	
17		VccT	Module Transmitter Ground	1
18	CML-I	TD+	Receiver Non-Inverted Data output	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	1

Note:

1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host bard.

Table 1: SFP+ Module PIN Definition

4. TRANSCEIVER BLOCK DIAGRAM



5. ABSOLUTE MAXIMUM RATING

These values represent the damage threshold of the module. Stress in excess of any of

Parameters	Symbol	Min.	Max.	Unit
Power Supply Voltage	Vcc	0	3.6	V
Storage Temperature	Tc	-40	85	°C
Operating Case Temperature	Tc	0	70	°C
Relative Humidity	RH	5	95	%
RX Input Average Power	Pmax	-	0	dBm

the individual Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating

Table 2: Absolute Maximum Rating

6. RECOMMENDED OPERATING ENVIRONMENT

Recommended Operating Environment specifies parameters for which the

Parameters	Symbol	Min.	Typical	Max.	Unit
Power Supply Voltage	Vcc	3.135	3.3	3.465	V
Operating Case Temperature	Tc	0	25	70	°C

electrical and optical characteristics hold unless otherwise noted.

Table 3: Recommended Operating Environment

7. OPTICAL CHARACTERISTICS

The following characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Values	Unit
Operating Reach	2-10K	m
Transmitter		
Center wavelength (range)	1260-1355	nm
Side Mode Suppression Ratio (min)	30	dB
Launched power		
- maximum (average)	0.5	dBm
- maximum (average)	-8.2	dBm
- OMA	0.2	dBm
- OMA-TDP (min)	-6.2	dBm
Transmitter and dispersion penalty (max)	3.2	dB
Average launch power of OFF transmitter (max)	-30	dBm
Extinction ratio (min)	3.5	dB
RIN12 OMA (max)	-128	dB/Hz
Optical Return Loss Tolerance (min)	12	dB
Receiver		
Center wavelength (range)	1260-1355	nm
Receive overload (max) in average power (note 1)	0.5	dBm
Receive sensitivity (min) in average power (note 1)	-14.4	dBm
Receiver sensitivity (max) in OMA (note2)	-12.6	dBm
Receiver Reflectance (max)	-12	dB
Stressed receiver sensitivity (max) in OMA (note2)	-10.3	dBm
Vertical eye elosure penalty (min)(note3)	2.2	dB
Los Assert (min)	-30	dBm
Los Dessert (max)	-12	dBm
Los Hysteresis (min)	0.5	dB
Stressed eye jitter (min)(note2)	0.3	UIp-p
Receive electrical 3dB upper cut off frequency (max)	12.3	GHz

Receiver power (damage, Max)	1.5	dBm

Note:

1. Average optical power shall be measured using the methods spevified in TIA/EIA-455-95.
2. Receiver sensitivity is informative. Stressed receiver sensitivity shall be measured with conformance test signal for BER =1x 10^{-12}
3. Vertical eye closure penalty and stressed eye jitter are the test conditions for measuring stressed receiver sensitivity. They are not the required characteristic of the receiver.
4. Power budget is defined as the different between the Rx sensitivity and the Tx. Output power of the interface.
5. Path penalty is intended as the power penalty of the interface between back-to-back and the maximum applied dispersion.

8. DIGITAL DIAGNOSTIC FUNCTIONS

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF8472 Rev10.2 with internal calibration mode. For external clibration please contact our sales staff.

Parameters	Symbol	Min.	Max.	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	degC	Over operating temp
Laser power monitor absolute error	DMI_TX	-3	3	dB	
RX power monitor absolute error	DMI_RX	-3	3	dB	-1dBm to -15dBm range
Supply voltage monitor absolute error	DMI_VCC	-0.08	0.08	V	Full operating range
Bias current monitor	DMI_Ibias	-10%	10%	mA	

Table 5: Digital diagnostic specification table

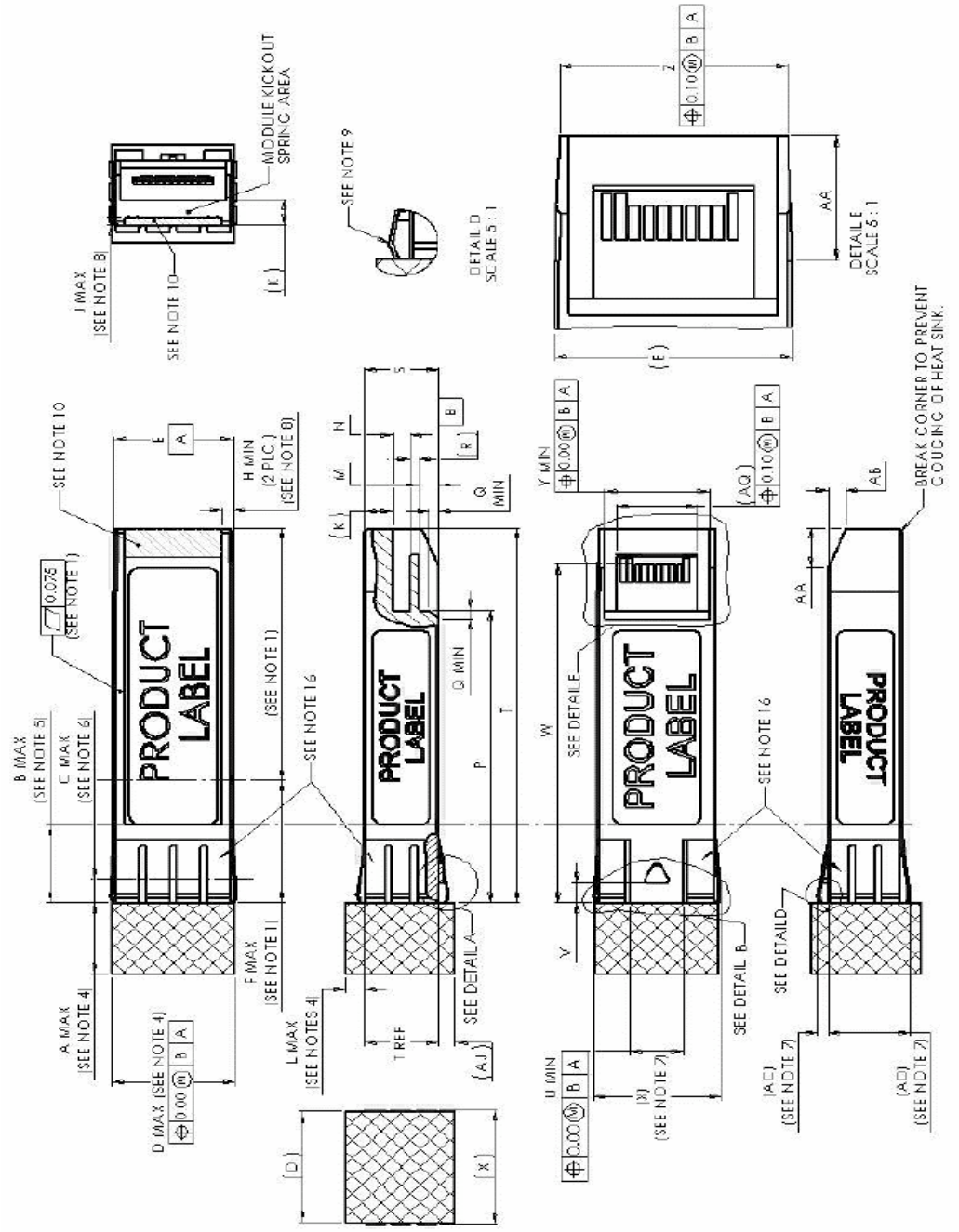
9. ELETRICAL CHARACTERISTICS

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

PIN	Symbol	Min.	Typical	Max.	Unit	Notes
Data Rate		-	10.3125	-	Gbps	
Power Consumption		-	800	1000	mW	
Transmitter						
Single Ended Output Voltage Tolerance		-0.3	-	4	V	
C common mode voltage tolerance		15	-	-	mV	
Tx Input Diff Voltage	VI	90		350	mV	
Tx Fault	Vol	-0.3		0.4	V	At 0.7 nA
Data Dependent Input Jitter	DDJ			0.1	UI	
Data Input Total Jitter	TJ			0.28	UI	
Receiver						
Single Ended Output Voltage Tolerance		-0.3	-	4	V	
Rx Output Diff Voltage	Vo	150		425	mV	
Rx Output Rise and Fall Time	Tr/Tf	30			ps	20% to 80%
Total Jitter	TJ			0.7	UI	
Deterministic Jitter	DJ			0.7	UI	

11. MECHANICAL

Complies with SFF-8432 rev. 5.0



Contact Information

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Add-On Computer, Inc. is a leading supplier of Memory Upgrade, Network Transceivers and Network connectivity products to Channel Partners, Resellers and OEMs, with more than seventeen years of direct industry experience. Add-On Computer (ACP) has been the exclusive supplier to Ingram Micro's "Memory Upgrades" program for the past nine years.

Add-On Computer maximizes profitable opportunities for our partners. Our ability to source product worldwide, ensures that our pricing will always be competitive. Offering turnkey solutions, Add-On Computer has forged a reputation as a solutions provider, delivering high quality, cost effective product in a timely and reliable manner.

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